FAST-NEUTRON GAMMA-RAY PRODUCTION FROM ELEMENTAL IRON: $E_n \lesssim 2$ MeV

by

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ABSTRACT

A Ge(Li) detector and a fission detector were used to measure elemental differential-cross-section excitation functions for fast-neutron gamma-ray production from iron relative to fast-neutron fission of ^{235}U. Data were acquired at $\sim$ 50 keV intervals with $\sim$ 50 keV neutron-energy resolution from near threshold to $\sim$ 2 MeV. Angular distributions for the 0.847-MeV gamma ray were measured at 0.93, 0.98, 1.08, 1.18, 1.28, 1.38, 1.59, 1.68, 1.79, 1.85 and 2.03 MeV. Significant fourth-order terms were required for the Legendre polynomial expansions used in fitting several of these angular distributions. This casts doubt on the accuracy of the commonly used approximation that the integrated gamma-ray production cross section is essentially equal to 4π times the 55-degree (or 125-degree) differential cross section. The method employed in processing these data is described. Comparison is made between results from the present work and some previously reported data sets. The uncertainties associated with energy scales, neutron-energy resolution and other experimental factors for these various measurements make it difficult to draw conclusions concerning the observed differences in the values reported for these fluctuating cross sections.

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